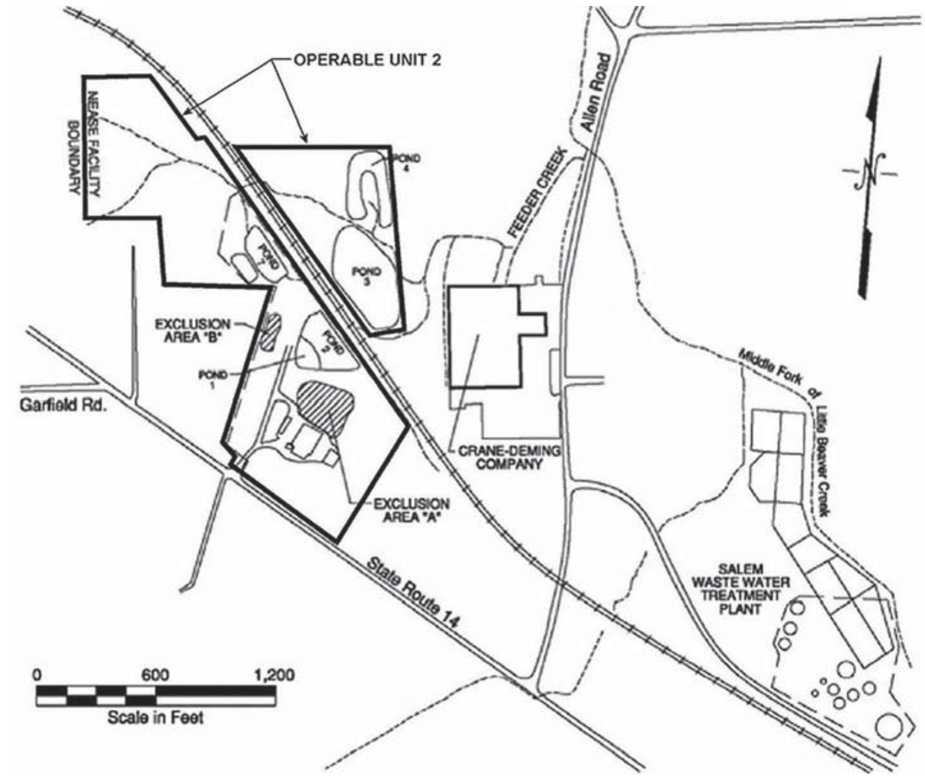
United States
Environmental Protection
Agency

‘Cutting-Edge’ Techniques Proposed for Nease Cleanup

Nease Chemical Site
Columbiana County, Ohio June 2005



Nease Chemical site plan
(not all of the Middle Fork of Little Beaver Creek is shown)

Innovative techniques could be used to clean up the Nease Chemical site under a plan[1] proposed by U.S. Environmental Protection Agency. The proposal will be discussed at a public meeting on Wednesday, June 22, and area residents will have 30 days to comment on the proposal. Based on those comments and documents in the administrative record (see back page), EPA will select the option, modify the proposal, or pick another one.

This is the first of two planned cleanup proposals for the site (referred to as Operable Unit 2, see map). It addresses ground water (water that collects underground in the spaces between dirt, gravel, and rock), the old plant facility and soil. A later proposal will address Feeder Creek and the Middle Fork of Little Beaver Creek.

After extensive study, EPA – working closely with Ohio EPA and Ruetgers

[1] *Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requires publication of a notice and a proposed plan for the site remediation. The proposed plan must also be made available to the public for comment. This proposed plan is a summary of information contained in the remedial investigation, feasibility study, and other documents in the administrative record for the Nease Chemical site. Please consult those documents for more detailed information.*

For more information...

If you are interested in the Nease Chemical cleanup, please attend the upcoming public meeting on Wednesday, June 22, at the Salem Public Library, 821 E. State St., from 6:30 - 8:30 p.m.

Written comments on the proposed plan should be submitted from June 1 - June 30:

- orally or in writing at the public meeting
- electronically via the Internet at epa.gov/region5/publiccomment/
- via fax to Susan Pastor at (312) 353-1155

Contact EPA

Susan Pastor
EPA Community Involvement Coordinator
(312) 353-1325 or (800) 621-8431, weekdays 10 a.m. - 5:30 p.m.
pastor.susan@epa.gov
fax: (312) 353-1155

Mary Logan
EPA Remedial Project Manager
(312) 886-4699 or (800) 621-8431, weekdays 10 a.m. - 5:30 p.m.
logan.mary@epa.gov

As this project is being done in cooperation with Ohio EPA, questions can also be directed to:

Sheila Abraham
Site Coordinator
Division of Emergency and Remedial Response
Ohio EPA Northeast District Office
(330) 963-1290
sheila.abraham@epa.state.oh.us

Organics Corp. – has developed five possible ways to clean up the site. The recommended option (Option B) involves "nano-technology" to clean the ground water under the site. The traditional cleanup method for ground water is to pump it out, treat it and return it to the aquifer (an underground water-bearing rock formation) from which it came. But this is expected to be less effective and more costly than the recommended option at this site.

A unique method is also recommended for cleaning up two areas that once were ponds but have become partially filled in with waste and other solid material. The plan is to "strip" most of the chemicals from the ground and solidify the remaining soil with a cement-like substance.

About the Nease site

The Nease Chemical Superfund site consists of 44 acres along state Route 14, two and one-half miles northwest of Salem on the Columbiana-Mahoning county line. The site is surrounded by lightly developed land on three sides and an industrial plant on the northeast. The area is partially fenced to prevent access. Railroad tracks intersect the northern portion of the site near the fence.

Most of the site has been taken over by plants. Trees border the eastern and western sides of the fenced area. The land just north of the fence is swampy, with a small stream called Feeder Creek running through it. Feeder Creek empties into the Middle Fork of Little Beaver Creek, which is north and east of the site.

Between 1961 and 1973, Nease Chemical produced various household cleaning compounds, fire retardants and pesticides — some of which contained mirex.

Banned in the United States in 1978, mirex breaks down slowly in the environment. It may remain in soil and water for years. The effects of mirex on people's health is not certain. At high levels it may cause damage to the skin, liver, nervous system or reproductive system.

In 1977, Ruetgers Organics Corp. acquired the Nease property but never operated at the site. In 1983, the site was placed on EPA's Superfund list, also referred to as the National Priorities List. Since then, Ruetgers Organics Corp., with oversight from EPA and Ohio EPA, has studied the type and extent of contamination.

The Nease company used unlined ponds to treat waste from the manufacturing process. The "ponds" however, no longer contain much water; in fact they are often referred to as former ponds. The pond areas are not large. They take up about 6 $^{1}/_{2}$ acres of the site. Over the years, the ponds were filled in with waste and soil. What was once a pond is now a boggy area, solid in some places and spongy in others. The primary contaminants in the ponds are mirex and volatile organic compounds, known as VOCs (chemicals that evaporate or dissolve into water easily).

Contaminants seeped into the soil and ground water from these ponds, as well as from buried drums that eventually leaked. The leaky drums formerly located in Exclusion Areas A and B (see map on Page 1) were dug up and taken off site. Chemical contamination remains, especially in Ponds 1 and 2. These ponds contain very high levels of mirex and VOCs. The primary contaminant in the ground water is VOCs. The most severely contaminated ground water is found near Ponds 1 and 2.

Surface water runoff from the waste-treatment ponds and nearby soil flowed into creek branches that run through the site, moving mirex contamination into the Middle Fork of Little Beaver Creek. Surface water and sediment control structures were built on-site to prevent contaminant movement until the final cleanups are complete.

Summary of site risks

One of the main pollutants EPA found on the site is mirex. It is in the soil and in and around the former ponds. It is also in the Middle Fork of Little Beaver Creek and in the fish that live in the creek. Other contaminants include VOCs in ground water and the former ponds.

A document called an "endangerment assessment" considers what the risk to people or the environment would be if the site

What is Nanoscale Zero-valent Iron?

Iron nanoparticles are emerging as a leading cutting-edge technology to clean up ground water. Ultra-small particles of iron can destroy contaminants based on chemical reactions similar to rusting. Zero-valent means the iron is in metallic form and ready to react with other chemicals. When conditions are right, the iron nanoparticles react with ground-water contaminants, which are converted into harmless byproducts.

The microscopic iron particles are especially useful because of their size — a human hair is 500 to 5,000 times wider. At that size, they can flow with the ground water into tiny spaces in soil and rock and reach contaminants that other cleanup methods cannot. After cleanup, the iron particles settle and become part of the soil.

Evaluating the options

EPA used the following nine criteria to evaluate each of the options. The table on Page 5 compares each one against these criteria:

1. *Overall Protection of Human Health and the Environment* addresses whether an option adequately protects human health and the environment. This criteria can be met by reducing or eliminating contaminants, or by reducing exposures to them.
2. *Compliance with Applicable or Relevant and Appropriate Requirements*, referred to as ARARs, assures that each project complies with federal, state and local laws and regulations.
3. *Long-term Effectiveness and Permanence* evaluates how well an option will work in the long term, including how safely remaining contaminants can be managed.
4. *Reduction of Toxicity, Mobility or Volume through Treatment* addresses how well the option reduces the harmful effects, movement and amount of contaminants.
5. *Short-term Effectiveness* is how quickly the option can be done, as well as its potential harm to workers, residents and the environment.
6. *Implementability* evaluates the technical difficulty in building and operating the cleanup system and whether materials and services are available to carry out the project.
7. *Cost* includes estimated capital or start-up costs. An example is the cost of buildings, treatment systems and monitoring wells. It also considers costs to implement the cleanup and operate and maintain it over time. Examples include laboratory analysis, repairs and personnel hired to operate equipment. A cleanup is considered cost effective if its costs are proportionate to its overall effectiveness.
8. *State Acceptance* is whether the state environmental agency, in this case Ohio EPA, agrees with EPA's recommended option.
9. *Community Acceptance* evaluates how well the community near the site accepts the option. EPA and Ohio EPA will evaluate community acceptance after the public comment period.

is not cleaned up. There are no current risks to people living near the site because the worst contamination is confined to the Nease property, which is off limits to the public. There is some contamination in ground water, but nobody is drinking that water today. Small animals that live on-site might be at risk from contaminated soil.

In the future, if people were exposed to the contaminants, the highest risk would be for those who use polluted ground water. People could also be exposed to pollution by touching dirt at the site. Future health risks could include an increased risk of cancer and other diseases, mainly from prolonged exposure. People who live or work in the area would be most at risk because they have a greater chance of coming in contact with contamination consistently over a period of time. The less often people are exposed to the pollution, the lower the risk.

Cleanup options

EPA considered five options for cleaning up the Nease site, each of which was evaluated against nine criteria as required by law (see box above). Each option has four parts because the site has four distinct areas, each of which has a different contamination problem or physical condition, which may require a different cleanup approach. The areas are: Ponds 1 and 2, remaining ponds and soil, and shallow and deep ground water.

Here are details on the five options

Option A:

No further action. Nothing additional would be done to clean up, monitor or manage the contamination. However, the existing systems that collect shallow ground water would continue to run. These systems were originally built to collect the worst ground-water contamination near Ponds 1 and 2. Estimated cost: $4.7 million

Option B: (EPA recommends this option.)

Ponds 1 and 2 would be treated with a process called "stripping/stabilization/solidification," or S/S/S. This is a unique combination of methods in which a device with rotating metal plates – similar to a large garden tiller turned on its side – is sunk 15 to 20 feet beneath the surface of the ponds. As the plates rotate, they churn up the chemicals and bring them to the surface as air is injected through a long tube. The chemicals are captured, treated and properly disposed of before they can evaporate into the air. The device cannot treat all the waste at once, so it will be used in several different places within Ponds 1 and 2. When most of the contamination has been removed from the former ponds, the device would be used to mix a cement-like substance into the ground. This prevents any remaining contamination from spreading.

Remaining ponds and soil would be covered with thick plastic sheets and a layer of clean soil. This plastic-and-soil cover will prevent rain from soaking through and spreading the remaining contaminants. It will cover Ponds 1, 2 and 7 and Exclusion Areas A and B. Other areas, such as Ponds 3 and 4, will be covered with clean soil only to prevent contact with the contaminants.

Shallow ground water on the eastern side of the site would be collected in a trench, pumped above the ground and treated to remove the contamination. The plastic sheets over the ponds and contaminated soil will reduce the amount of rain that soaks through the dirt so there will be less contaminated ground water. If studies show it will work, the trench design may be changed to allow treatment inside the trench with some combination of iron, biological treatment or carbon in a series of treatment cells rather than pumping the water out.

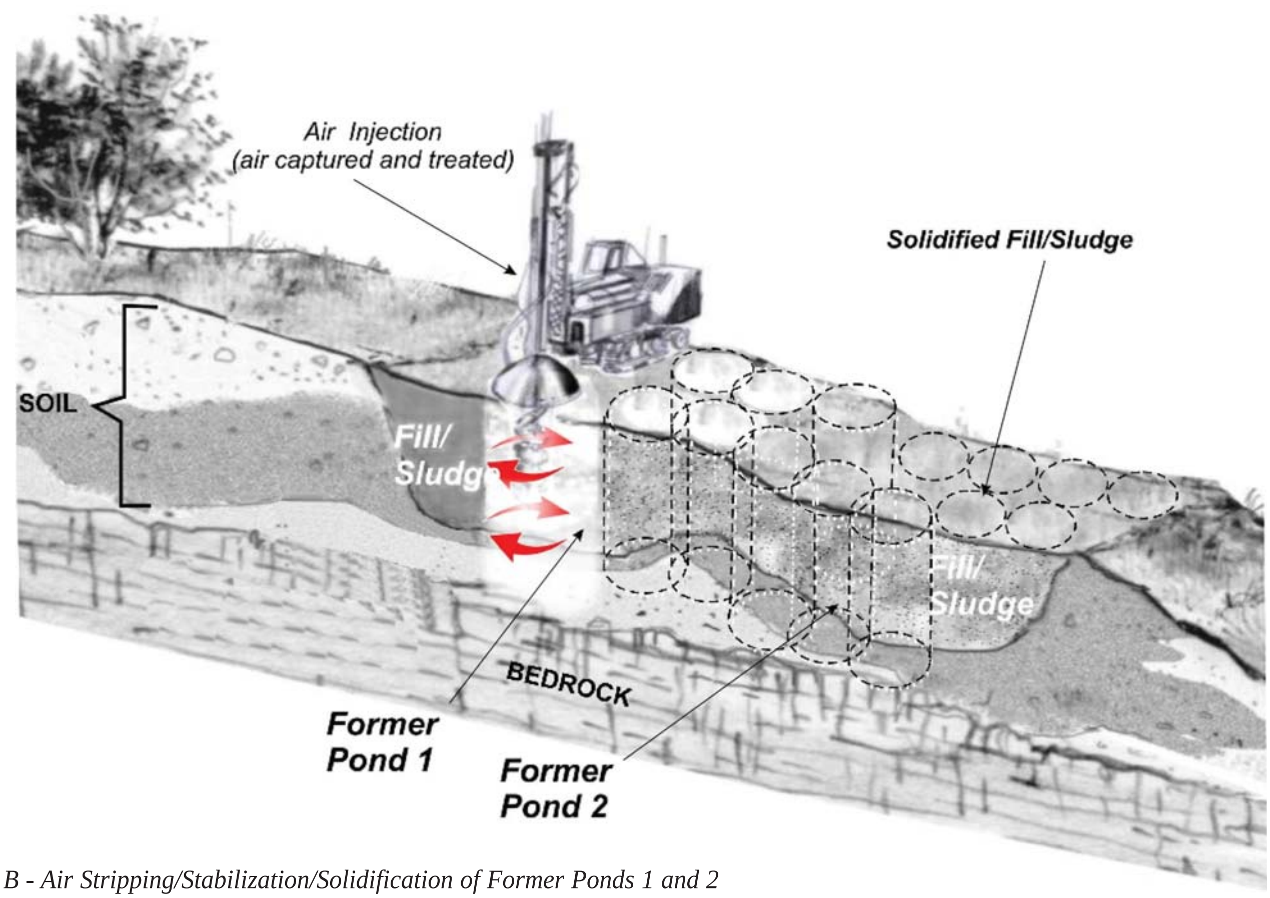
Deep ground water and the southern area would be treated by injecting a substance known as "nanoscale zero-valent iron." These microscopic particles of specially treated iron clean the ground water chemically. The advantage of this innovative technology is that the iron particles flow with the ground water, cleaning the underground aquifer as the water flows. There are cracks in the bedrock under the site, and these tiny iron particles will reach into the smallest cracks. Because of the conditions at the Nease site, this method is expected to be more effective than traditional techniques used for cleaning ground water.
Estimated cost: $19 million

Option C:
Ponds 1 and 2 would be treated with a process called "thermal desorption." In this approach, heaters are inserted into the former ponds and the entire area is covered with a temporary protective metal layer. Heat from the electrical current causes the contaminants to evaporate. The vapors are captured and treated.

Remaining ponds and soil would be covered with a layer of clean soil to keep the contaminants in place and prevent people or animals from coming into contact with them.

Shallow ground water would be treated by a series of cells in the ground similar to Option B.

Deep ground water and the southern area would be treated by injecting nanoscale zero-valent iron, the same as in Option B.
Estimated cost: $24.7 million



Option B - Air Stripping/Stabilization/Solidification of Former Ponds 1 and 2

Option D:
Ponds 1 and 2 would be covered with thick plastic sheets or clay and clean soil. A cement-like substance would be poured around the edges of the former ponds and injected below the bottom of the ponds. This would keep the contamination in place, and the area would be monitored to ensure it does not harm people or the environment.

Remaining ponds and soil would be covered with clean soil, the same as in Option C.

Shallow ground water on the eastern side of the site would be collected in a trench, pumped above the ground and treated to remove the contamination. This is similar to Option B, without allowing treatment inside the trench because ground water flow is expected to be too high. Shallow ground water in the southern area would be treated by nanoscale zero-valent iron.

Deep ground water would use standard pump-and-treat technology using a series of extraction wells. Water would be pumped through these wells above the ground and treated to remove the contamination. While pump-and-treat has been used often, it may not work here because it is difficult to pump contamination caught in bedrock cracks.
Estimated cost: $21.4 million

Option E:
Ponds 1 and 2 would be treated by the S/S/S process, the same as in Option B.

Remaining ponds and soil would be covered with clean soil, the same as in Option C.

Shallow ground water would be treated by a series of cells in the ground, the same as in Option C.

Deep ground water and the southern area would be treated by injecting nanoscale zero-valent iron, the same as in Option B.
Estimated cost: $13.8 million

Common features

Each option (except A) includes what EPA calls "institutional controls." These include such measures as fences to limit access to the site and deed restrictions to keep anyone from building anything on the site in the future that would require digging in restricted areas. In addition, use of contaminated ground water will be prohibited. If new buildings are constructed on the site, measures will be taken to prevent soil vapors from seeping into them.

Each option (except A) also includes a cover or cap over the former ponds and contaminated soil. These areas would be monitored after the cleanup to ensure that the cover continues

Evaluation of cleanup options for the Nease Chemical Site

Evalution Criteria	Option A No further Action	Option B	Option C	Option D	Option E
1. Overall Protection of Human Health and the Environment	□	■	■	■	■
2. Compliance with ARARs	□	■	■	■	■
3. Long-term Effectiveness and Permanence	□	■	⊙	⊙	⊙
4. Reduction of Toxicity, Mobility, or Volume Through Treatment	⊙	■	■	⊙	■
5. Short-term Effectiveness	⊙	■	⊙	■	■
6. Implementability	■	⊙	⊙	⊙	⊙
7. Cost	**$4.7 million**	**$19 million**	**$24.7 million**	**$21.4 million**	**$13.8 million**
8. State Acceptance	Ohio EPA supports EPA's proposed option, but will consider public comments before final determination of state acceptance.				
9. Community Acceptance	Community acceptance of the recommended option will be evaluated after the public comment period.				

■ Fully meets criteria ⊙ Partially meets criteria □ Does not meet criteria

The recommended option, B, is expected to give the best results by treating the waste and ground water. It is the option that best meets the evaluation criteria above.

United States
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Agency

Region 5
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Chicago, IL 60604

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'Cutting-Edge' Techniques Proposed for Nease Cleanup

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to keep the contamination from harming people or the environment. In some areas, natural processes such as dilution, decay and evaporation will be allowed to clean the ground water. Ground water will be monitored until the cleanup is done.

Options C, D and E don't include a plastic cover. This means more rain would soak into the ground, making these options less effective on shallow ground-water treatment.

Next steps

EPA and Ohio EPA will consider comments received during the public comment period before choosing a final cleanup plan. EPA will address comments in a document called a "responsiveness summary." This is attached to the record of decision, which will outline the final cleanup plan.

Risks from the contamination in the Middle Fork of Little Beaver Creek will be discussed in a future cleanup proposal. The actions already taken and those proposed in this plan (except Option A) will ensure that no more contamination reaches the creek.

Site-related documents may be reviewed at:

EPA Region 5 Record Center
77 W. Jackson Blvd., 7th Floor
Chicago, Ill.

Ohio EPA Northeast District Office
2110 E. Aurora Road
Twinsburg, Ohio

Lepper Library
303 E. Lincoln Way
Lisbon, Ohio

Salem Public Library
821 E. State St.
Salem, Ohio

Certain EPA information, including this fact sheet, can be reviewed electronically at: www.epa.gov/region5/sites.

An administrative record, which contains detailed information upon which the selection of a cleanup plan will be based, is also located at the Salem Public Library and at the EPA Chicago office.

Comment Sheet

U.S. Environmental Protection Agency is interested in your comments on the proposed cleanup plan for the Nease Chemical site. EPA will consider public comments before selecting a final cleanup for the site. Please use the space below to write your comments, then fold and mail this form. Comments must be postmarked by Thursday, June 30. If you have any questions, please contact Susan Pastor at (312) 353-1325 or through EPA's toll-free number at (800) 621-8431. This comment sheet may also be faxed to her at (312) 353-1155. Those with electronic capabilities may submit their comments via the Internet at epa.gov/region5/publiccomment.

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